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BOTANY OF THE MONTANA ROCKIES

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The wide topographic diversity of Montana is reflected in the varied forms of its plant life. Its high mountains, deep canyons, broad valleys and open plains provide the settings for a display of floral compositions lending charm and interest to its landscapes. As one travels westward over the wide plains of eastern Montana he views from the car window great rolling ranges of grassland through which the courses of streams are marked by lines of cottonwoods and willows. Along the breaks between the benches and the river bottoms are scattered pines and junipers, the outposts of the coniferous forests darkening the slopes of distant mountains which appear first in isolated peaks like sentinels guarding the approach to the summit of the continent. In the more arid localities the grasses thin out and patches of sage appear. If in June, one may see stalks of the Spanish bayonet covered with white flowers and the yellow blossoms of the low prickly pear. Both the Yucca and the cactus are the northernmost representatives of their kind, but are widely distributed over the plains and foothills adjacent to the Rocky Mountains.

The annual rainfall lessens with the distance westward until the ascent of the mountains begins when it increases, owing to greater altitudes. This accounts for the appearance of forests which begin to cover the slopes and ridges. Throughout the Rocky Mountains coniferous forests abound especially at elevations above 5000 feet. Below this level the effect of diminished precipitation is seen in the occurrence of grasslands especially on southern exposures, while on the northern slopes the forests extend into the valleys. These forests reach far to the northwest into British Columbia and Alaska, thence southward along the Cascade and Coast Ranges to California.

As coniferous forests are the dominant form of vegetation over most of the mountain landscape a word as to their composition may be of interest. In Montana there are five species of pine: the western yellow pine which is found from British America to Mexico and from the Black Hills to the coast; the lodgepole pine, abundant over large areas at middle elevations; the western white pine confined to the moister valleys and lower slopes; and two which occupy the high mountains, the white bark and limber pines. Larch or tamarack is represented by two species, one only on the highest mountains and comparatively rare, the other growing in northern valleys and on lower slopes where it constitutes one of the valuable assets of the lumber industry. Spruce also abounds at higher elevations and follows down the narrow canyons almost to the open valleys. Two kinds of hemlock appear in the western and more humid parts of the state. One of these, the larger, is found abundantly in Glacier Park and west to Oregon and Washington; the other, a species of the higher mountains, is more restricted in its range and abounds especially in the Coeur d'Alenes. Douglas fir, which forms the bulk of the great forests along the Pacific Coast of the northwest, is plentiful here also, but of smaller form due to the drier and colder climate. The true firs are represented by two species: one, the grand fir, confined to a limited range in the moister localities; the other extensively distributed over the higher elevations of the Rockies where it often braves the rigors of an alpine climate bound in snow and ice for nine months of the year. Its sharp spire-like form marks it as far as it can be seen. One of our most pleasing trees is the arbor vitae which in favored localities forms heavy forests so dense that sunlight rarely reaches the ground beneath their spreading boughs. This also is one of the west coast trees which has migrated into the Rocky Mountains. A few junipers may be added to complete the list. The most conspicuous of these forms small bushy trees on the drier slopes. These trees are commonly known as cedars and have a wide range of form and size in relation to the conditions under which they grow.

Hardwood species which constitute the main body of the forests of the middle west are almost wholly absent. Along the streams of the mountain region, cottonwoods and willows, birch and alder, a few hawthorns and choke cherries, make up

nine-tenths of the broad-leaved, deciduous trees and shrubs. Their occurrence is these places is due apparently to the shallow distribution of the underground waters.

Shrubby vegetation is largely mingled with the forest trees. it occurs along streams and over the uplands. One of the most beautiful shrubs in flower is the mock orange or wild syringa, which bears masses of large white fragrant flowers. The ninebark, the white and red spiraeas, the service berry, hawthorn and chokecherry, the mountain ash, honeysuckles and elders, huckleberrys and heaths, the white and the purple clematis, the roses, mountain laurel, and sumac, buffalo berry and silver berry, the currants,—most of these are attractive in flower or leaf or fruit. Of about two hundred fifty species of woody plants in the northern Rockies about fifty are willows which vary from tree forms down to dwarf arctic species which flower and fruit at a height of two inches. Many of these have a northern range only, from here to the arctic circle. They grow under varied conditions from stream banks to the tops of the highest mountains.

Our woodland flora is not complete without mention of the low flowering herbs which abound in the shelter of the forest. Here are the Solomon's seals, and bellworts, the dogtooth violet, the yellow Mariposa lily, the little pink lady-slipper and the large yellow mocassin flower, the mitrewort and the false mitrewort, the trailing kinnikinnic, the blue, the white, and the yellow violets, the pasque flower and paint brush, some of the arnicas, the bane berries and many others.

While the forests clothe the higher slopes and sheltered places, large treeless areas of the intermountain valleys are occupied by a prairie flora rich in its diversity of color and abundant in its variety of forms. Spring opens with a carpet of green figured in elaborate patterns of floral composition in bright hues and shades. Fields of gold appear where the balsam-root bursts forth on the sunny hillside. The little mountain pink brings a blush of color here and there. Acres of the bitter root in varying shades of rose and pink are spread in rich profusion, and the blues of lupine and pentstemon and patches of scarlet Gilia lend color everywhere across the wide flats. Clarkia with its rich pink extends in profusion along the lower slopes, varied with tufts of white meadow sweet and bunches of golden aster.

On drier spots Oreocarya and patches of matted Phlox lie like little snow drifts. Time will not suffice to mention all of the beautiful flowers that enrich the summer landscape.

From the earliest yellow buttercups the march of the season brings in review the mountain pink and shooting stars of the primrose family, the saxifrages, the lilies, the roses, the peas, the parsleys, borages, mints, daisies, asters, golden rods and many others. And one need not go far afield to find them all. They begin in February or March, swell to fullest abundance in June and July, and end in October.

The season of flowering depends much upon the altitude, being earliest at the lowest and latest at the highest elevations. In this way some of the species bloom from May to August at successively higher levels. The dogtooth violet flowering at 3500 feet in May at the latitude of Missoula may often be found in bloom on the first of August, at the altitude of 7000 feet. From the middle of July to the middle of August the mountain parks of the northern Rockies are gorgeous gardens of wild flowers in a riot of colors. The alpine summer is a brief season. It seems as if the spring, summer and autumn floras of lower levels were concentrated into one brief month. Its days are filled with bright sunshine and surging growth. Snow banks thin to the edge in a layer of ice through which the shoots of tender plants bore their way as if unable to wait for the ground to clear. Here are the dogtooth violets, the paint brushes and anemones, hare bells and blue-bells, saxifrages and daisies. In some places the meadow is filled with gentians of deepest blue, again they abound in the white spikes of the bog orchid and ladies tresses, or in the green flowers of the Scottish asphodel. Some of the more luxuriant meadows abound in cone flower, boneset, groundsel and the tall larkspur and purple monkshood.

Among the other mountain flowers a few may be mentioned. The bear grass which sends up tall spikes of creamy white flowers extends in great profusion through the open woods and over treeless slopes. Its delicate grace is worthy of a place in park or garden if it could be lured successfully from its mountain home. The white rhododendron occurs in the Bitter Root and Mission ranges and with the Labrador tea bears white flowers, while the mountain heather spreads its evergreen mats covered by mantles of purple bells. Stately stalks of white hellebore

rise in sheltered places with attractive foliage and tall panicles of green flowers. Lesser plants of the buckwheats, the mustards, the pinks and many others combine to make the high mountain flora one of exceptional interest. Of interest not only because of its beauty and comparative rarity, but because it represents largely an arctic or northern type of vegetation which lives in places of exposure and vicissitudes and also because it represents a flora less familiar to the botanist on account of its more remote and less accessible location.

Another point of interest in connection with the northern vegetation, is that we have here, near the ridge of the continent, an overlapping of the eastern and western floras. Plants from the Atlantic states and the middle west have spread westward to the summit of the Rocky Mountains and beyond. Those of the Pacific region have moved eastward, in the case of some species, as far as the Great Lakes. Many spread by means of wind-blown seeds and the direction of prevailing winds has much to do with their distribution. Some are scattered mainly by birds which are influenced largely in their movements by topography and the climatic conditions which follow from it. The history of the recent geological past is bound up with that of the Rocky Mountain flora and adds much to the interest of its study.

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An Additional Species of Peperomia from Florida.—The large tropical genus *Peperomia* has crossed the Gulf Stream sparingly and settled in Florida in five species which fall into three groups. They are all humus plants. The two species with small herbaceous leaves—*P. humilis* and *P. cumulicola*—grow in the humus of the hammock floor, thus they are terrestrial, at least in position. The three plants with coriaceous leaves fall into two groups: *P. spatulifolia* has a branching inflorescence and grows on humus covered rocks, while *P. obtusifolia* and *P. floridana* have a simple inflorescence and grow on living trees or decaying logs.

Peperomia floridana Small, sp. nov. Plants epiphytic, odorless or faintly aromatic: stems prostrate and creeping or sometimes elongate and vinelike, often matted: leaf-blades ovate to

suborbicular, broadest above the middle or below it, 4–9 cm. long, rounded to retuse at the apex, rather long-petioled: inflorescence with a short stout stalk, with usually a single stiffly stout spike less than 1 dm. long, green, the rachis 5 mm. thick or less, stout-tipped; bracts orbicular, scarcely 0.3 mm. in diameter: anthers about 0.2 mm. in diameter: berries densely crowded, the bodies cylindric-ovoid or cylindric, 1 mm. long, more or less truncate at the base, the beak slightly shorter than the body, hooked.—Tree trunks, rotten logs, and humus, hammocks, southern peninsular Florida and Florida Keys.—(W. I.) Type from the Ross Hammock, Dade County, Florida. Small and Carter No. 2478, collected November 12, 1906.

Upon entering any hammock on the Everglade Keys, one of the more peculiar plants to meet one's eye is the above described *Peperomia*. It not only grows on the trunks and branches of living rough-barked trees, particularly on the live-oak (*Quercus virginiana*), where it is often intimately tangled, but also on decaying logs. The stems are sometimes greatly elongate and vine-like. Although an epiphyte, plants of this species also grow well under cultivation in the greenhouses of The New York Botanical Garden. In the herbarium, localities additional to that of the type specimen are represented as follows:

Hammock eastern border of Everglades, A. H. Curtiss No. 2460**.

Hammock, Lemon City, J. H. Simpson No. 571 (1892).

Snapper Creek hammock, J. K. Small & G. V. Nash No. 48 (1901).

Brickell hammock, J. K. Small & J. J. Carter No. 1443 (1903).

Scott hammock, J. K. Small & J. J. Carter No. 981 (1903).

Snapper Creek hammock, E. G. Britton No. 387 (1904).

Brickell hammock, J. K. Small & G. K. Small No. 4811 (1913).

Royal Palm hammock, J. K. Small & E. W. Small No. 5442 (1915).

Sykes hammock, J. K. Small & C. A. Mosier No. 5501 (1915).

Sykes hammock, J. K. Small, C. A. Mosier & E. W. Small No. 5649 (1915).

Nixon-Lewis hammock, J. K. Small & C. A. Mosier No. 5892 (1915).

John K. Small.